

Claims

1. An image correction apparatus comprising:
 - an image input part to which an image including plural character element rows are input;
 - a row detection part for detecting a predetermined character element row from the plural character element rows;
 - a correction amount calculating part for performing calculation of a position correction amount in a column direction with respect to each pixel column on the predetermined character element row; and
 - a position correction part for correcting a position of each pixel column of the image so as to move it in the column direction based on the position correction amount calculated with respect to each pixel column in a predetermined direction.
2. The image correction apparatus according to claim 1, wherein the row detection part has a histogram generating part for generating an integrated histogram along a row direction of the image, and detects the longest character element row based on the integrated histogram.
3. The image correction apparatus according to claim 2, wherein the row detection part has a pixel position extracting part for extracting a pixel position where a value of the integrated histogram generated in the histogram generating part becomes the maximum, and detects the longest character element row based on the pixel position.

4. The image correction apparatus according to claim 3, wherein the row detection part has a range identifying part for identifying a pixel position range where the value of the integrated histogram falls within a predetermined range as a range of the longest character element row from the pixel position extracted in the pixel position extracting part.

5. The image correction apparatus according to claim 1, wherein the correction amount calculating part has an end position detection part for detecting an end position in the column direction with respect to each character element of the predetermined character element row, and calculates the position correction amount based on a displacement amount of the end position with respect to each of the character element rows.

6. The image correction apparatus according to claim 5, wherein the correction amount calculating part calculates the displacement amount based on an envelope curve connecting the end positions detected by the end position detection part with respect to each of the character elements.

7. An image correction apparatus comprising:

an image input part to which an image including plural character element rows are input;

a histogram generating part for generating an integrated histogram along a row direction of the image;

a pixel position extracting part for extracting a pixel

position where a value of the integrated histogram generated in the histogram generating part becomes the maximum;

a range identifying part for identifying a pixel position range where the value of the integrated histogram falls within a predetermined range as a range of the longest character element row from the pixel position extracted in the pixel position extracting part;

an end position detection part for detecting an end position in the column direction in the image with respect to each character element of the longest character element row;

a position correction amount calculating part for calculating a displacement amount of the end positions with respect to each of the character elements based on an envelope curve connecting the end positions detected by the end position detection part with respect to each of the character elements; and

a position correction part for correcting the image with respect to each pixel column so as to move it in the column direction based on the position correction amount.

8. An image correction apparatus comprising:

an image input part to which a first image including plural character element rows are input;

an expanded row generating part for generating a second image including plural expanded rows by expanding the first image in the row direction;

a starting position detection part for detecting a starting position of the expanded row in the column direction with respect to each pixel column of the second image;

a correction amount calculating part for calculating a position correction amount in the column direction with respect to each pixel column of the second image; and

a position correction part for correcting a position of each pixel column of the first image so as to move it in the column direction based on the position correction amount.

9. The image correction apparatus according to claim 8, wherein the second image is a binarized image having brightness values expressed by a value of 0 or 1.

10. The image correction apparatus according to claim 9, wherein the starting position detection part performs detection of the starting position of the expanded row in the column direction by, while moving a pixel of interest in the column direction, detecting a brightness value of the pixel of interest with respect to each of the pixel columns, and, when equal to or more than a predetermined number of pixels having brightness values of 0 continue, setting a position where the pixel having the brightness value of 0 is detected for the first time as the starting position.

11. The image correction apparatus according to claim 10, wherein the starting position detection part performs detection of the starting position of the expanded row in the column

direction with respect to each of plural expanded rows, and

the correction amount calculating part calculates the position correction amount based on an average value of a starting position distribution of each of the plural expanded rows in the column direction.

12. An image correction apparatus comprising:

an image input part to which a binarized first image including plural character element rows are input;

an expanded row generating part for generating a second image including plural expanded rows by expanding the first image in a row direction;

a starting position detection part for, while moving a pixel of interest in a column direction, detecting a brightness value of the pixel of interest with respect to each pixel column of the second image, and, when equal to or more than a predetermined number of pixels having brightness values of 0 continue, detecting a position where the pixel having the brightness value of 0 is detected for the first time as a starting position of the expanded row;

a correction amount calculating part for calculating a position correction amount with respect to each of the pixel columns of the second image based on an average value of a starting position distribution of the plural expanded rows in the column direction; and

a position correction part for correcting the first image

with respect to each of the pixel columns so as to move it in the column direction based on the position correction amount.

13. Information equipment comprising the image correction apparatus according to any one of claims 1 to 12.

14. A cellular phone device comprising the image correction apparatus according to any one of claims 1 to 12.

15. An image correction method comprising:

a first step for detecting a predetermined character element row from an image including plural character element rows;

a second step for calculating a position correction amount with respect to each pixel column of the predetermined character element row; and

a third step for correcting the image with respect to each pixel column so as to move it in the column direction based on the position correction amount.

16. An image correction method comprising:

a first step for generating a second image including plural expanded rows by expanding a first image including plural character element rows in a row direction;

a second step for detecting a starting position of the expanded row in a column direction with respect to each pixel column of the second image; and

a third step for correcting a position of the first image so as to allow starting positions of the expanded row in the

column direction to align with each other based on information of the starting positions of the expanded row in the column direction.